

9. REFERENCES

CHAPTER 9

REFERENCES

- Abbott, W.S. (1925) A method of computing the effectiveness of an insecticide. *J. Econ. Entomol.*, **18**, 265–267
- Abdelbasit, K.M. & Plackett, R.L. (1982) Experimental design for joint action. *Biometrics*, **38**, 171–179
- Abelson, R.P. & Tukey, J.W. (1963) Efficient utilization of non-numerical information in quantitative analysis: General theory and the case of simple order. *Ann. Math. Stat.*, **34**, 1347–1369
- Aitkin, M. & Clayton, D. (1980) The fitting of exponential, Weibull and extreme value distributions to complex censored survival data using GLIM. *Appl. Stat.*, **29**, 156–163
- Anderson, M.W., Hoel, D.G. & Kaplan, N.L. (1980) A general scheme for the incorporation of pharmacokinetics in low-dose risk estimation for chemical carcinogenesis: Example – vinyl chloride. *Toxicol. appl. Pharmacol.*, **55**, 154–161
- Andervont, H.B. (1944) Influence of environment on mammary cancer in mice. *J. natl Cancer Inst.*, **4**, 579–581
- Anscombe, F.J. (1949) The statistical analysis of insect counts based on the negative binomial distribution. *Biometrics*, **5**, 165–173
- Anscombe, F.J. (1950) Sampling theory of the negative binomial and logarithmic series distributions. *Biometrika*, **37**, 358–382
- Armitage, P. (1955) Tests for linear trends in proportions and frequencies. *Biometrics*, **11**, 375–386
- Armitage, P. (1966) The chi-square test for heterogeneity of proportions, after adjustment for stratification. *J. R. stat. Soc. B*, **28**, 150–163. Addendum, **29**, (1967), 197
- Armitage, P. (1971) *Statistical Methods in Medical Research*, 2nd ed., New York, John Wiley & Sons
- Armitage, P. (1982) The assessment of low-dose carcinogenicity. *Biometrics*, **38**, (Supplement on Current Topics in Biostatistics and Epidemiology), 119–129
- Armitage, P. & Doll, R. (1954) The age distribution of cancer and a multi-stage theory of carcinogenesis. *Br. J. Cancer*, **8**, 1–12
- Armitage, P. & Doll, R. (1961) *Stochastic models for carcinogenesis*. In: Neyman, J., ed., *Proceedings of the Fourth Berkeley Symposium VI*, Berkeley, CA, Univ. California Press, pp. 19–38
- Armsen, P. (1955) Tables for significance tests of 2×2 contingency tables. *Biometrika*, **42**, 494–511

- Arnold, D.L., Moodie, C.A., Grice, M.C., Charbonneau, S.M., Stavric, B., Collins, B.T., McGuire, P.F., Zawidzka, Z.Z. & Munro, I.C. (1980) Long-term toxicity of ortho-toluenesulfonamide and sodium-saccharin in the rat. *Toxicol. appl. Pharmacol.*, **52**, 113–152
- Arnold, D.L., Krewski, D. & Munro, I.C. (1983a) Saccharin: A toxicological and historical perspective. *Toxicology*, **27**, 179–256
- Arnold, D.L., Krewski, D.R., Junkins, D.B., McGuire, P.F., Moodie, C.A. & Munro, I.C. (1983b) Reversibility of ethylenethiourea-induced thyroid lesions. *Toxicol. appl. Pharmacol.*, **67**, 264–273
- Arnold, D.L., Moodie, C.A., Charbonneau, S.M., Grice, H.C., McGuire, P.F., Bryce, F.R., Collins, B.T., Zawidzka, Z.Z., Krewski, D.R., Nera, E.A. & Munro, I.C. (1985) Long term toxicity of hexachlorobenzene in the rat and the effect of dietary vitamin A. *Food Chem. Toxicol.*, **23**, 779–793.
- Ayer, M., Brunk, H.D., Ewing, G.M., Reid, W.T. & Silverman, E. (1955) An empirical distribution function for sampling with incomplete information. *Ann. Math. Stat.*, **26**, 641–647
- Baker, R.J. & Nelder, J.A. (1978) *General Linear Interactive Modelling (GLIM) Release 3*, Oxford, Numerical Algorithms Group
- Ball, J.K. (1970) Immunosuppression and carcinogenesis: Contrasting effects with 7, 12-dimethylbenz(a)anthracene, benz(a)pyrene and 3-methylcholanthrene. *J. natl Cancer Inst.*, **44**, 1–10
- Barlow, R.E., Bartholomew, D.J., Bremner, J.M. & Brunk, H.D. (1972) *Statistical Inference Under Order Restrictions: The Theory and Application of Isotonic Regression*, New York, John Wiley & Sons
- Bayer, L. & Cox, C. (1979) Algorithm AS 142. Exact tests of significance in binary regression models. *Appl. Stat.*, **28**, 319–324
- Bergman, S.W. & Turnbull, B.W. (1983) Efficient sequential designs for destructive life testing with application to animal serial sacrifice experiments. *Biometrika*, **70**, 305–314
- Berlin, B., Brodsky, J. & Clifford, P. (1979) Testing dependence in survival experiments with serial sacrifice. *J. Am. stat. Assoc.*, **74**, 5–14
- Bernstein, L., Anderson, J. & Pike, M.C. (1981) Estimation of the proportional hazard in two-treatment-group clinical trials. *Biometrics*, **37**, 513–519
- Berry, G. & Wagner, J.C. (1969) The application of a mathematical model describing the times of occurrence of mesotheliomas in rats following inoculation with asbestos. *Br. J. Cancer*, **23**, 582–586
- Bhappkar, V.P. & Patterson, K.W. (1977) On some nonparametric tests for profile analysis of several multivariate samples. *J. Multivariate Anal.*, **7**, 265–277
- Bickis, M. & Krewski, D. (1985) *The statistical design and analysis of the long-term carcinogenicity bioassay*. In: Clayson, D., Krewski, D. & Munro, I., eds, *Toxicological Risk Assessment*, Vol. I, Boca Raton, FL, CRC Press, pp. 125–147
- Bishop, Y.M.M., Fienberg, S.E. & Holland, P.W. (1974) *Discrete Multivariate Analysis*, Cambridge, MA, MIT Press
- Bliss, C.I. (1953) Fitting the negative binomial distribution to biological data. *Biometrics*, **9**, 176–196

- Boik, R.J. (1981) A priori tests in repeated measures designs – Effects of non-sphericity. *Psychometrika*, **46**, 241–255
- Box, G.E.P. (1950) Problems in the analysis of growth and wear curves. *Biometrics*, **6**, 362–389
- Box, G.E.P. & Cox, D.R. (1964) An analysis of transformations. *J. R. stat. Soc. B*, **26**, 211–252
- Breslow, N. (1970) A generalized Kruskal-Wallis test for comparing K samples subject to unequal patterns of censorship. *Biometrika*, **57**, 579–594
- Breslow, N.E. (1974) Covariance analysis of censored survival data. *Biometrics*, **30**, 89–99
- Breslow, N.E. (1975) Analysis of survival data under the proportional hazards model. *Int. stat. Rev.*, **43**, 45–57
- Breslow, N.E. & Day, N.E. (1980) *Statistical Methods in Cancer Research*, Vol. 1, *The Analysis of Case-Control Studies (IARC Scientific Publications No. 32)*, Lyon, International Agency for Research on Cancer
- Breslow, N.E., Day, N.E., Tomatis, L. & Turusov, V.S. (1974) Associations between tumor types in a large-scale carcinogenesis study of CF-1 mice. *J. natl Cancer Inst.*, **52**, 233–239
- Breslow, N.E., Edler, L. & Berger, J. (1984) A two-sample censored-data rank test for acceleration. *Biometrics*, **40**, 1049–1062
- Brown, C.C. & Fears, T.R. (1981) Exact significance levels for multiple binomial testing with application to carcinogenicity screens. *Biometrics*, **37**, 763–774
- Brownlee, K.A. (1965) *Statistical Theory and Methodology in Science and Engineering*, New York, John Wiley & Sons
- Bryan, W.R. & Shimkin, M.B. (1943) Quantitative analysis of dose-response data obtained with three carcinogenic hydrocarbons in strain C3H male mice. *J. natl Cancer Inst.*, **3**, 503–531
- Cairns, T. (1980) The ED₀₁ study: Introduction, objectives and experimental design. *J. environ. Pathol. Toxicol.*, **3**, 1–7
- Carlborg, F.W. (1981) Multi-stage dose-response models in carcinogenesis. *Food Cosmet. Toxicol.*, **19**, 361–365
- Chakravorti, S.R. (1974) On some tests of growth curve model under Behrens-Fisher situation. *J. Multivariate Anal.*, **4**, 31–51
- Chambers, E.A. & Cox, D.R. (1967) Discrimination between alternative binary response models. *Biometrika*, **54**, 573–578
- Chand, N. & Hoel, D.G. (1974) *A comparison of models for determining safe levels of environmental agents*. In: Proschan, F. & Serfling, R.J., eds., *Reliability and Biometry*, Philadelphia, PA, Society of Industrial and Applied Mathematics, pp. 681–700
- Chapman, D.G. & Nam, J. (1968) Asymptotic power of chi square tests for linear trends in proportions. *Biometrics*, **24**, 315–327, errata, **25** (1969), 777
- Chen, H.J. (1984) Sample size determinations when two binomial proportions are very small. *Commun. Stat.-Theor. Meth.*, **A13**, 2707–2712
- Chernoff, H. (1972) *Sequential Analysis and Optimal Design*, Philadelphia, PA, Society of Industrial and Applied Mathematics

- Chu, I., Villeneuve, D.C., Velli, V.E., Secours, V.E. & Becking, G.C. (1981) Chronic toxicity of photomirex in the rat. *Toxicol. appl. Pharmacol.*, **59**, 268–278
- Clayson, D.B. (1981) Carcinogens and carcinogenesis enhancers. *Mutat. Res.*, **86**, 217–229
- Clayson, D.B., Krewski, D.R. & Munro, I.C. (1983) The power and interpretation of the carcinogenicity bioassay. *Regul. Toxicol. Pharmacol.*, **3**, 329–348
- Cochran, W.G. (1943) Analysis of variance for percentages based on unequal numbers. *J. Am. stat. Assoc.*, **38**, 287–301
- Cochran, W.G. (1954) Some methods for strengthening the common χ^2 tests. *Biometrics*, **10**, 417–451
- Cochran, W.G. (1974) *The vital role of randomization in experiments and surveys*. In: Neyman, J., ed., *The Heritage of Copernicus: Theories Pleasing to the Mind*, Cambridge, MA, MIT Press, pp. 445–463
- Conover, W.J. (1980) *Practical Nonparametric Statistics*, 2nd Ed. New York, John Wiley & Sons
- Cook, P.J., Doll, R. & Fellingham, S.A. (1969) A mathematical model for the age distribution of cancer in man. *Int. J. Cancer*, **4**, 93–112
- Cornfield, J. (1956) *A statistical problem arising from retrospective studies*. In: Neyman, J., ed., *Proceedings of the Third Berkeley Symposium IV*, Berkeley, CA, Univ. California Press, pp. 135–148
- Cornfield, J. (1977) Carcinogenic risk assessment. *Science*, **198**, 693–699
- Cox, D.R. (1958) The regression analysis of binary sequences. *J. R. stat. Soc. B*, **20**, 215–242
- Cox, D.R. (1959) The analysis of exponentially distributed life-times with two types of failure. *J. R. stat. Soc. B*, **21**, 411–421
- Cox, D.R. (1966) *Some procedures connected with the logistic qualitative response curve*. In: David, F.N., ed., *Research Papers in Statistics, Festschrift for J. Neyman*, New York, John Wiley & Sons, pp. 55–71
- Cox, D.R. (1970) *The Analysis of Binary Data*, London, Chapman & Hall
- Cox, D.R. (1972) Regression models and life-tables (with discussion). *J. R. stat. Soc. B*, **34**, 187–220
- Cox, D.R. & Hinkley, D.V. (1974) *Theoretical Statistics*, London, Chapman & Hall
- Cox, D.R. & Oakes, D. (1984) *Analysis of Survival Data*, London, Chapman & Hall
- Cranmer, M.F., Lawrence, L.R., Konvincka, A.J. & Herrick, S.S. (1978) NCTR computer systems designed for toxicologic experimentation. I. Overview. *J. environ. Pathol. Toxicol.*, **1**, 701–709
- Crouch, E. & Wilson, R. (1981) Regulation of carcinogens. *Risk Anal.*, **1**, 47–57
- Crump, K.S. (1979) Dose response problems in carcinogenesis. *Biometrics*, **35**, 157–167
- Crump, K.S. (1982) Designs for discriminating between binary dose response models with applications to animal carcinogenicity experiments. *Commun. Stat.-Theor. Meth.*, **A11**, 379–394
- Crump, K.S. (1983) Ranking carcinogens for regulation (Letter). *Science*, **219**, 236–237

- Crump, K.S. (1984) An improved procedure for low dose carcinogenic risk assessment from animal data. *J. environ. Pathol. Toxicol. Oncol.*, **5**, 339–348
- Crump, K.S. & Howe, R.B. (1980) *A Small-sample Study of Permutation Tests for Detecting Teratogenic Effects (Technical Report)*, Washington DC, Ebon Research Systems
- Crump, K.S. & Howe, R.B. (1985) *A review of methods for calculating confidence limits in low dose extrapolation*. In: Clayson, D., Krewski, D. & Munro, I., eds, *Toxicological Risk Assessment*, Vol. I, Boca Raton, FL, CRC Press, pp. 187–203
- Crump, K.S., Hoel, D.G., Langley, C.H. & Peto, R. (1976) Fundamental carcinogenic processes and their implications for low dose risk assessment. *Cancer Res.*, **36**, 2973–2979
- Crump, K.S., Guess, H.A. & Deal, K.L. (1977) Confidence intervals and test of hypotheses concerning dose response relations inferred from animal carcinogenicity data. *Biometrics*, **33**, 437–451
- Cuzick, J. (1982) The efficiency of the proportions test and the logrank test for censored survival data. *Biometrics*, **38**, 1033–1039
- Cuzick, J. (1985) Wilcoxon-type test for trend. *Stat. Med.*, **4**, 87–90
- Daniel, D.L. (1983) *The analysis of body weight data*. Presented at the East Kent Local Group of the Royal Statistical Society, 17 March 1983
- Daniel, C. & Wood, F.S. (1971) *Fitting Equations to Data: Computer Analysis of Multifactor Data for Scientists and Engineers*, New York, John Wiley & Sons
- Davies, R.F., Lee, P.N. & Rothwell, K. (1974) A study of the dose response of mouse skin to cigarette smoke condensate. *Br. J. Cancer*, **30**, 146–156
- Davis, R.K., Stevenson, G.T. & Busch, K.A. (1956) Tumor incidence in normal Sprague-Dawley female rats. *Cancer Res.*, **16**, 194–197
- Day, N.E. & Brown, C.C. (1980) Multistage models and primary prevention of cancer. *J. natl Cancer Inst.*, **64**, 977–989
- Day, T.D. (1967) Carcinogenic action of cigarette smoke condensate on mouse skin. *Br. J. Cancer*, **21**, 56–81
- Dempster, A.P., Selwyn, M.R. & Weeks, B.J. (1983) Combining historical and randomized controls for assessing trends in proportions. *J. Am. stat. Assoc.*, **78**, 221–227
- Dewanji, A. & Kalbfleisch, J.D. (1986) Non-parametric methods for survival/sacrifice experiments. *Biometrics* (in press)
- Dinse, G.E. (1985) Testing for a trend in tumor prevalence rates: I. Nonlethal tumors. *Biometrics*, **41**, 751–770
- Dinse, G.E. & Lagakos, S.W. (1982) Nonparametric estimation of lifetime and disease onset distributions from incomplete observations. *Biometrics*, **38**, 921–932
- Dinse, G.E. & Lagakos, S.W. (1983) Regression analysis of tumour prevalence data. *Appl. Stat.*, **32**, 236–248, addendum, **33** (1984), 79–80
- Dobson, A.J. & Gebski, V. (1986) Sample sizes for comparing two independent proportions using the continuity-corrected arc sine transformation. *Statistician*, **35**, 51–53
- Doll, R. (1971) The age distribution of cancer: Implications for models of carcinogenesis. *J. R. stat. Soc. A*, **134**, 133–155

- Doll, R. & Peto, R. (1978) Cigarette smoking and bronchial carcinoma: Dose and time relationships among regular smokers and life long non-smokers. *J. Epidemiol. Community Health*, **32**, 303–313
- Drinkwater, N.R. & Klotz, J.H. (1981) Statistical methods for the analysis of tumor multiplicity data. *Cancer Res.*, **41**, 113–119
- Druckrey, H. (1967) *Quantitative aspects in chemical carcinogenesis*. In: Truhaut, R., ed., *Potential Carcinogenic Hazards from Drugs. Evaluation of Risks (UICC Monograph Series)*, Berlin (West), Springer-Verlag, pp. 60–78
- Druckrey, H., Preussmann, R., Ivankovic, S. & Schmähl, D. (1967) Organotrope carcinogene Wirkungen bei 65 verschiedenen N-Nitroso-Verbindungen an BD-Ratten. *Z. Krebsforsch.*, **69**, 103–201
- Dunn, O.J. (1964) Multiple comparisons using rank sums. *Technometrics*, **6**, 241–252
- Dunn, O.J. (1974) On multiple tests and confidence intervals. *Commun. Stat.*, **3**, 101–103
- Dunnett, C.W. (1955) A multiple comparisons procedure for comparing several treatments with a control. *J. Am. stat. Assoc.*, **50**, 1096–1121
- Dunnett, C.W. (1964) New tables for multiple comparisons with a control. *Biometrics*, **20**, 482–491
- Dutt, J.E., Mattes, K.D. & Tao, L.C. (1975) *Tables of the Trivariate t for Comparing Three Treatments to a Control with Unequal Sample Sizes*, G.D. Searle and Co., Mathematical and Statistical Services, TR3
- Dutt, J.E., Mattes, K.D., Soms, A.P. & Tao, L.C. (1976) An approximation to the maximum modulus of the trivariate T with a comparison to the exact values. *Biometrics*, **32**, 465–469
- Edgington, E.S. (1980) *Randomization Analysis*, New York, Marcel Dekker
- Elashoff, J.D. (1981) Repeated-measures bioassay with correlated errors and heterogeneous variances: A Monte-Carlo study. *Biometrics*, **37**, 475–482
- Elashoff, R.M. & Beal, S. (1976) Two-stage screening designs applied to chemical-screening problems with binary data. *Ann. Rev. Biophys. Bioeng.*, **5**, 561–587
- Elashoff, R.M. & Preston, D.L. (1977) *An investigation of the properties of some two sample two-stage designs*. In: Krishnaiah, P.R., ed., *Applications of Statistics*, Amsterdam, North-Holland Press, pp. 407–432
- Elashoff, R.M., Preston, D.L. & Fears, T.R. (1979) Comparison and evaluation of some experimental designs for use in carcinogen screening. *J. natl Cancer Inst.*, **62**, 1209–1219
- Environmental Protection Agency (1979) Water quality criteria: Availability. *Fed. Reg.*, **44**, 56627–56657
- Faccini, I.M. & Naylor, D. (1979) Computer analysis and integration of animal pathology data. *Arch. Toxicol., Suppl. 2*, 517–520
- Fare, G. (1965) The influence of number of mice in a box on experimental skin tumour production. *Br. J. Cancer*, **19**, 871–877
- Fears, T.R. & Douglas, J.F. (1977a) Suggested procedure for reducing the pathology workload in a carcinogen bioassay program. Part I. *J. environ. Pathol. Toxicol.*, **1**, 125–137
- Fears, T.R. & Douglas, J.F. (1977b) Suggested procedure for reducing the pathology workload in a carcinogen bioassay program. Part II. Incorporating blind pathology

- techniques and analysis for animals with tumors. *J. environ. Pathol. Toxicol.*, **1**, 211-222
- Fears, T.R. & Schneiderman, M.A. (1974) Pathologic evaluation and the blind technique (Letter to the Editor). *Science*, **183**, 1144-1145
- Fears, T.R. & Tarone, R.E. (1977) Response to "Use of statistics when examining lifetime studies in rodents to detect carcinogenicity." *J. Toxicol. environ. Health*, **3**, 629-632
- Fears, T.R., Tarone, R.E. & Chu, K.C. (1977) False-positive and false-negative rates for carcinogenicity screens. *Cancer Res.*, **37**, 1941-1945
- Felsky, G., Villeneuve, D.C. & Farmer, D. (1979) An interactive toxicological data handling system for a PDP-12 computer. *Comput. Programs Biomed.*, **10**, 75-80
- Festing, M.F.W. (1979) *Inbred Strains in Biomedical Research*, Oxford, Oxford University Press
- Fisher, J.C. & Hollomon, J.H. (1951) A hypothesis for the origin of cancer foci. *Cancer*, **4**, 916-918
- Fisher, R.A. (1935) The logic of inductive inference. *J. R. stat. Soc.*, **98**, 39-54
- Food Safety Council (1978) Proposed system for food safety assessment. Chronic toxicity testing. *Food Cosmet. Toxicol.*, **16** (Suppl. 2), 97-108
- Fox, J.G., Thibert, P., Arnold, D.L., Krewski, D.R. & Grice, H.C. (1979) Toxicology studies. II. The laboratory animal. *Food Cosmet. Toxicol.*, **17**, 661-675
- Frangos, C.C. & Stone, M. (1984) On jackknife, cross-validity and classical methods of estimating a proportion with batches of different sizes. *Biometrika*, **71**, 361-366
- Freundt, K.J. (1982) Mixed exposures to chemical hazards. *Occup. Health Saf.*, **51**, 10-13, 39-42
- Frith, C.H., Herrick, S.S. & Konvicka, A.J. (1977) Computer assisted collection and analysis of pathology data. *J. natl Cancer Inst.*, **58**, 1717-1727
- Frith, C.H., Baetcke, K.P., Nelson, C.J. & Schieferstein, G. (1979) Importance of the mouse liver tumor in carcinogenesis bioassay studies using benzidine dihydrochloride as a model. *Toxicol. Lett.*, **4**, 507-518
- Frith, C.H., Boothe, A.D., Greenman, D.L. & Farmer, J.H. (1980) Correlations between gross and microscopic lesions in carcinogenic studies in mice. *J. environ. Pathol. Toxicol.*, **3**, 139-153
- Gail, M.H., Santner, T.J. & Brown, C.C. (1980) An analysis of comparative carcinogenesis experiments based on multiple times to tumor. *Biometrics*, **36**, 255-266
- Gainer, J.H. & Pry, T.W. (1972) Effects of arsenicals on viral infections in mice. *Am. J. vet. Res.*, **33**, 2299-2307
- Gart, J.J. (1962) On the combination of relative risks. *Biometrics*, **18**, 601-610
- Gart, J.J. (1970) Point and interval estimation of the common odds ratio in the combination of 2×2 tables with fixed marginals. *Biometrika*, **57**, 471-475
- Gart, J.J. (1972) Contribution to the discussion on the paper by D.R. Cox, Regression Models and Life Tables. *J. R. stat. Soc. B*, **34**, 212-213
- Gart, J.J. (1975) Letter to the Editor. *Br. J. Cancer*, **31**, 696-697
- Gart, J.J. (1976) *Statistical analysis of the first mouse skin painting study*. In: Gori, G.B., ed., *Toward Less Hazardous Cigarettes Report No. 1* (DHEW Publication No.

- (NIH)76-905), Washington DC, Department of Health, Education, and Welfare, pp. 109-121
- Gart, J.J. (1977) Exact and approximate tests for relative potency. *Bull. int. stat. Inst.*, **47**, 172-175
- Gart, J.J. & Thomas, D.G. (1972) Numerical results on approximate confidence limits for the odds ratio. *J. R. stat. Soc. B*, **34**, 441-447
- Gart, J.J., Chu, K.C. & Tarone, R.E. (1979) Statistical issues in interpretation of chronic bioassay tests for carcinogenicity. *J. natl Cancer Inst.*, **62**, 957-974
- Gaylor, D.W., Chen, J.J. & Kodell, R.L. (1985a) Experimental designs of bioassays due for screening and low dose extrapolation. *Risk Anal.*, **5**, 9-16
- Gaylor, D.W., Chen, J.J., Greenman, D.L. & Thompson, C.H. (1985b) Occurrence of tumors among litters of BALB/C female mice. *J. natl Cancer Inst.*, **74**, 803-809
- Gehring, P.J. & Blau, G.E. (1977) Mechanisms of carcinogenesis: dose response. *J. environ. Pathol. Toxicol.*, **1**, 163-179
- Gehring, P.J., Watanabe, P.G. & Park, C.N. (1978) Resolution of dose response toxicity data for chemicals requiring metabolic activation: Example - vinyl chloride. *Toxicol. appl. Pharmacol.*, **44**, 581-591
- Geisser, S. (1980) *Growth curve analysis*. In: Krishnaiah, P., ed., *Handbook of Statistics*, Vol. 1, Amsterdam, North-Holland, pp. 89-115
- Gladen, B. (1979) The use of the jackknife to estimate proportions from toxicological data in the presence of litter effects. *J. Am. stat. Assoc.*, **74**, 278-283
- Glasbey, C.A. (1979) Correlated residuals in non-linear regression applied to growth data. *Appl. Stat.*, **28**, 251-259
- Gold, L.S., Sawyer, C.B., Magaw, R., Backman, G.M., de Veciana, M., Levinson, R., Hooper, N.K., Havender, W.R., Bernstein, L., Peto, R., Pike, M.C. & Ames, B.N. (1984) A carcinogenic potency database of the standardized results of animal bioassays. *Environ. Health Perspect.*, **58**, 9-319
- Goodman, D.G., Ward, J.M., Squire, R.A., Chu, K.C. & Linhart, M.S. (1979) Neoplastic and nonneoplastic lesions in aging F344 rats. *Toxicol. appl. Pharmacol.*, **48**, 237-248
- Graham, S.L., Davies, K.J., Hansen, W.H. & Graham, C.H. (1975) Effects of prolonged ethylene thiourea ingestion on the thyroid of the rat. *Food Cosmet. Toxicol.*, **13**, 493-499
- Greenman, D.L., Kodell, R.L. & Sheldon, W.G. (1984) Association between cage shelf level and spontaneous and induced neoplasms in mice. *J. natl Cancer Inst.*, **73**, 107-113
- Grice, H.C., Munro, I.C., Krewski, D.R. & Blumenthal, H. (1981) In utero exposure in chronic toxicity/carcinogenicity studies. *Food Cosmet. Toxicol.*, **19**, 373-379
- Grizzle, J.E. & Allen, D.M. (1969) Analysis of growth and dose response curves. *Biometrics*, **25**, 357-381
- Guess, H.A. & Crump, K.S. (1978) Maximum likelihood estimation of dose response functions subject to absolutely monotonic constraints. *Ann. Stat.*, **6**, 101-111
- Hammond, E.C., Selikoff, I.J. & Seidman, H. (1979) Asbestos exposure, cigarette smoking and death rates. *Ann. N.Y. Acad. Sci.*, **330**, 473-490

- Hartley, H.O. & Sielken, R.L. Jr (1977) Estimation of "safe doses" in carcinogenic experiments. *Biometrics*, **33**, 1-30
- Hartley, H.O. & Sielken, R.L. (1978) *Development of Statistical Methodology for Risk Estimation: Final Report*, College Station, TX, Texas A & M University, Institute of Statistics
- Haseman, J.K. (1977) Response to "Use of statistics when examining life time studies in rodents to detect carcinogenicity". *J. Toxicol. environ. Health*, **3**, 633-636
- Haseman, J.K. (1978) Exact sample sizes for use with the Fisher-Irwin test for 2×2 tables. *Biometrics*, **34**, 106-109
- Haseman, J.K. (1983a) Patterns of tumor incidence in two-year cancer bioassay feeding studies in Fischer 344 rats. *Fund. appl. Toxicol.*, **3**, 1-9
- Haseman, J.K. (1983b) A re-examination of false-positive rates for carcinogenesis studies. *Fund. appl. Toxicol.*, **3**, 334-339
- Haseman, J.K. (1985) *False positive issues in carcinogenicity testing: An examination of 16 studies with dual control groups*. In: *Proceedings of the Symposium on Long-Term Animal Carcinogenicity Studies: A Statistical Perspective*, Washington DC, American Statistical Association, pp. 73-80
- Haseman, J.K. & Hoel, D.G. (1979) Statistical design of toxicity assays: role of genetic structure of test animal population. *J. Toxicol. environ. Health*, **5**, 89-101
- Haseman, J.K. & Hogan, M.D. (1975) Selection of the experimental unit in teratology studies. *Teratology*, **12**, 165-172
- Haseman, J.K. & Kupper, L.L. (1979) Analysis of dichotomous data from certain toxicology experiments. *Biometrics*, **35**, 281-293
- Haseman, J.K. & Soares, E.R. (1976) The distribution of fetal death in control mice and its implications on statistical tests for dominant lethal effects. *Mutat. Res.*, **41**, 277-288
- Hatch, A.M., Winberg, G.S., Zawidzka, Z., Cann, M., Airth, J.M. & Grice, H.C. (1965) Isolation syndrome in the rat. *Toxicol. appl. Pharmacol.*, **7**, 737-745
- Haybittle, J.L. & Freedman, L.S. (1979) Some comments on the logrank test statistic in clinical trial applications. *Statistician*, **28**, 199-208
- Haux, R. (1985) Analysis of profiles based on ordinal classification functions and rank tests. *Biom. J.*, **27**, 607-622
- Health and Welfare Canada (1975) *The Testing of Chemicals for Carcinogenicity, Mutagenicity and Teratogenicity*, Ottawa
- Healy, M.J.R. (1972) Animal litters as experimental units. *Appl. Stat.*, **21**, 155-159
- Hennings, H. (1986) *Tumor promotion and progression in mouse skin*. In: Barret, J.C., ed., *Mechanisms of Environmental Carcinogenesis*, Vol. 2, Boca Raton, FL, CRC Press (in press)
- Herrick, S.S., Davis, C., Donnelly, D.V., Lockhart, T., Marek, L. & Russel, H. (1983) Histopathology automated system. *Drug Inf. J.*, **17**, 287-295
- Hewlett, P.S. & Plackett, R.L. (1979) *An Introduction to the Interpretation of Quantal Responses in Biology*, London, Arnold
- Hitchcock, S.E. (1966) Tests of hypotheses about the parameters of the logistic function. *Biometrika*, **53**, 535-544
- Hoel, D.G. (1980) Incorporation of background in dose-response models. *Fed. Proc.*, **39**, 73-75

- Hoel, D.G. (1983) *Conditional two-sample tests with historical controls*. In: Sen, P.K., ed., *Contributions to Statistics: Essays in Honour of Norman L. Johnson*, Amsterdam, North-Holland, pp. 229–236
- Hoel, D.G. & Walburg, H.E. (1972) Statistical analysis of survival experiments. *J. natl Cancer Inst.*, **49**, 361–372
- Hoel, D.G. & Yanagawa, T. (1986) Incorporating historical controls in testing for trends in proportions. *J. Am. stat. Assoc.* (in press)
- Hoel, D.G., Kaplan, N.L. & Anderson, M.W. (1983) Implication of nonlinear kinetics on risk estimation in carcinogenesis. *Science*, **219**, 1032–1037
- Hollander, M. & Wolfe, D.A. (1973) *Nonparametric Statistical Methods*, New York, John Wiley & Sons
- Hoover, K.L., Ward, J.M. & Stinson, S.F. (1980) Histopathologic differences between liver tumors in untreated (C57BL/6 × C3H) F1 (B6C3F1) mice and nitrofen-fed mice. *J. natl Cancer Inst.*, **65**, 937–948
- Howell, S.B., Dean, J.H. & Law, L.W. (1975) Defects in cell-mediated immunity during growth of a syngeneic simian virus-induced tumor. *Int. J. Cancer*, **15**, 152–169
- Huber, P.J. (1981) *Robust Statistics*, New York, John Wiley & Sons
- Hueper, W.C. & Wolfe, H.D. (1937) Experimental production of aniline tumors of the bladder in dogs. *Am. J. Pathol.*, **13**, 656
- Hueper, W.C., Wiley, F.H. & Wolfe, H.D. (1938) Experimental production of bladder tumors in dogs by administration of beta-naphthylamine. *J. ind. Hyg.*, **20**, 46–84
- Hulse, E.V., Mole, R.H. & Papworth, D.G. (1968) Radiosensitivities of cells from which radiation-induced skin tumours are derived. *Int. J. Radiat. Biol.*, **14**, 437–444
- IARC (1980) *IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans, Supplement 2, Long-term and Short-term Screening Assays for Carcinogens: A Critical Appraisal*, Lyon, International Agency for Research on Cancer
- IARC (1982a) *Information Bulletin on the Survey of Chemicals being Tested for Carcinogenicity*, No. 10, Lyon, International Agency for Research on Cancer
- IARC (1982b) *IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans, Supplement 4, Chemicals, Industrial Processes and Industries Associated with Cancer in Humans. IARC Monographs, Volumes 1 to 29*, Lyon, International Agency for Research on Cancer.
- Iball, J. (1939) The relative, potency of carcinogenic compounds. *Am. J. Cancer*, **35**, 188–190
- Interagency Regulatory Liaison Group (1979) Scientific bases for identification of potential carcinogens and estimation of risks. *J. natl Cancer Inst.*, **63**, 241–268
- Interdisciplinary Panel on Carcinogenicity (1984) Criteria for evidence of chemical carcinogenicity. *Science*, **225**, 682–687
- International Life Sciences Institute (1984a) *Age-associated (geriatric) pathology: Its impact on long-term toxicity studies*. In: Grice, H.C. ed., *Current Issues in Toxicology*, New York, Springer-Verlag, pp. 50–107
- International Life Sciences Institute (1984b) *The selection of doses in chronic toxicity/carcinogenicity studies*. In: Grice, M.C., ed., *Current Issues in Toxicology*, New York, Springer-Verlag, pp. 6–49

- Irwin, J.O. & Goodman, N. (1946) The statistical treatment of measurements of the carcinogenic properties of tars (Part I) and mineral oils (Part II). *J. Hyg.* **44**, 362-420
- Ivankovic, S. (1973) *Experimental prenatal carcinogenesis*. In: Tomatis, L. & Mohr, U., eds., *Transplacental Carcinogenesis (IARC Scientific Publications No. 4)*, Lyon, International Agency for Research on Cancer, pp. 92-99
- Iverson, S. & Arley, N. (1950) On the mechanism of experimental carcinogenesis. *Acta pathol. microbiol. Scand.*, **27**, 773-803
- Jonckheere, A.R. (1954) A distribution-free k -sample test against ordered alternatives. *Biometrika*, **41**, 133-145
- Jones, C.A., Marlino, P.H.J., Lijinsky, W. & Huberman, E. (1981) The relationship between the carcinogenicity and mutagenicity of nitrosoamines in a hepatocyte-mediated mutagenicity assay. *Carcinogenesis*, **2**, 1075-1077
- Kalbfleisch, J.D. & Prentice, R.L. (1980) *The Statistical Analysis of Failure Time Data*, New York, John Wiley & Sons
- Kalbfleisch, J.D., Lawless, J.L. & MacKay, R.J. (1982) *The estimation of small probabilities and risk assessment*. In: Lind, N.C., ed., *Technological Risk*, Waterloo, University of Waterloo Press, pp. 17-26
- Kalbfleisch, J.D., Krewski, D.R. & Van Ryzin, J. (1983) Dose-response models for time-to-response toxicity data (with discussion). *Can. J. Stat.*, **11**, 25-49
- Kaplan, E.L. & Meier, P. (1958) Nonparametric estimation from incomplete observations. *J. Am. stat. Assoc.*, **53**, 457-481
- Karlson, P. (1965). *Introduction to Modern Biochemistry*, 2nd ed., New York, Academic Press
- Kempthorne, O. (1977) Why randomize? *J. Stat. Planning Inference*, **1**, 1-25
- Kendall, M.G.K. & Stuart, A. (1961) *The Advanced Theory of Statistics*, Vol. 2. London, Griffin
- Khatri, C.G. (1966) A note on a MANOVA model applies to problems in growth curve. *Ann. Inst. Stat. Math.*, **18**, 75-86
- Kleinbaum, D.G. (1973) A generalization of the growth curve model which allows missing data. *J. Multivariate Anal.*, **3**, 117-124
- Kleinman, J.C. (1973) Proportions with extraneous variance: single and independent samples. *J. Am. stat. Assoc.*, **68**, 46-54
- Koch, G. G., Amara, I.A., Stokes, M.E. & Gillings (1980) Some views on parametric and nonparametric analysis for repeated measurements and selected bibliography. *Int. stat. Rev.*, **48**, 249-265
- Kodell, R.L. & Nelson, C.J. (1980) An illness-death model for the study of the carcinogenic process using survival/sacrifice data. *Biometrics*, **36**, 267-277
- Kodell, R.L., Shaw, G.W. & Johnson, A.M. (1982a) Nonparametric joint estimators for disease resistance and survival functions in survival/sacrifice experiments. *Biometrics*, **38**, 43-58
- Kodell, R.L., Farmer, J.H., Gaylor, D.W., & Cameron, A.M. (1982b) Influence of cause-of-death assignment on time-to-tumor analyses in animal carcinogenesis studies. *J. natl Cancer Inst.*, **69**, 659-664
- Koller, L.D. (1973) Immunosuppression produced by lead, cadmium and mercury. *Am. J. Vet. Res.*, **34**, 1457-1458

- Konvicka, A.J., Robinson, O. & Weiss, K. (1978) NCTR computer systems designed for toxicological experimentation. II. Experiment start-up system. *J. environ. Pathol. Toxicol.*, **1**, 711-719
- Korn, E.L. & Liu, P.Y. (1983) Interactive effects of mixtures of stimuli in life table analysis. *Biometrika*, **70**, 103-110
- Kowalski, C.J. & Guire, K.E. (1974) Longitudinal data analysis. *Growth*, **38**, 131-169
- Koziol, J.A., Maxwell, D.A., Fukushima, M., Colmerauer, M.E.M. & Pilch, Y.H. (1981) A distribution-free test for tumor-growth curve analyses with application to an animal tumor immunotherapy experiment. *Biometrics*, **37**, 383-390
- Krewski, D. & Van Ryzin, J. (1981) *Dose response models for quantal response toxicity data*. In: Csorgo, M., Dawson, D.A., Rao, J.N.K. & Saleh, A.K., eds., *Statistics and Related Topics*, Amsterdam, North-Holland, pp. 201-231
- Krewski, D., Crump, K.S., Farmer, J., Gaylor, D.W., Howe, D., Portier, C., Salsburg, D., Sielken, R.L. & Van Ryzin, J. (1983) A comparison of statistical methods for low dose extrapolation utilizing time-to-tumor data. *Fund. appl. Toxicol.*, **3**, 140-158
- Krewski, D., Brennan, J. & Bickis, M. (1984a) The power of the Fisher permutation test in $2 \times k$ tables. *Commun. Stat.-Simul. Comp.*, **B13**, 433-448
- Krewski, D., Kovar, J.G. & Bickis, M. (1984b) *Optimal experimental designs for low dose extrapolation. II. The case of nonzero background*. In: Chaubey, Y.P. & Dwivedi, T.P., eds, *Topics in Applied Statistics*, Montreal, Concordia University, pp. 167-191
- Krewski, D., Smythe, R.T. & Burnett, R.T. (1985) *The use of historical control information in testing for trend in quantal response carcinogenicity data*. In: *Proceedings of the Symposium on Long-term Animal Carcinogenicity Studies: A Statistical Perspective*, Washington DC, American Statistical Association, pp. 56-62
- Kuiper-Goodman, T., Krewski, D., Combley, H., Doran, M. & Grant, D.L. (1976) *Hexachlorobenzene-induced smooth endoplasmic reticulum in rat liver: a correlated stereologic and biochemical study*. In: *Proceedings of the Fourth International Congress for Stereology*, Washington DC, National Bureau of Standards Special Publication, Vol. 431, pp. 351-354
- Kulwich, B.A., Hardisty, J.F., Gilmore, C.E. & Ward, J.M. (1980) Correlations between gross observations of tumours and neoplasms diagnosed microscopically in carcinogenesis bioassays in rats. *J. environ. Pathol. Toxicol.*, **3**, 281-287
- Kupper, L.L. & Haseman, J.K. (1978) The use of a correlated binomial model for the analysis of certain toxicological experiments. *Biometrics*, **34**, 69-76
- Kuschner, M., Laskin, S., Drew, R.T., Cappiello, V. & Nelson, N. (1975) Inhalation carcinogenicity of alpha halo ethers: III. Lifetime and limited period inhalation studies with bis(chloromethyl)ether at 0.1 ppm. *Arch. environ. Health*, **30**, 73-77
- Lagakos, S.W. (1982) An evaluation of some two-sample tests used to analyze animal carcinogenicity experiments. *Util. Math.*, **21B**, 239-260
- Lagakos, S.W. & Louis, T.A. (1985) *The statistical analysis of rodent tumorigenicity experiments*. In: Clayson, D.B., Krewski, D. & Munro, I., eds, *Toxicological Risk Assessment*, Vol. I, Boca Raton, FL, CRC Press, pp. 149-163
- Lagakos, S. & Mosteller, F. (1981) A case study of statistics in the regulatory process: The FD&C Red No. 40 experiments. *J. natl Cancer Inst.*, **66**, 197-212

- Lagakos, S.W. & Ryan, L.M. (1985) On the representativeness assumption in prevalence tests of carcinogenicity. *Appl. Stat.*, **34**, 54–62
- Latta, R.B. (1981) A Monte Carlo study of some two-sample rank tests with censored data. *J. Am. stat. Assoc.*, **76**, 713–719
- Lawless, J.F. (1984) *Some problems concerning experimental design for extrapolation*. In: Chaubey, Y.P. & Dwivedi, T.P., eds, *Topics in Applied Statistics*, Montreal, Concordia University, pp. 357–366
- Lawrence, L.R., Konvicka, A.J., Ezell, R., Applegat, J., Green, G. & Fernstrom, E.B. (1979) NCTR computer systems designed for toxicologic experimentation. IV. Experiment information system. *J. environ. Pathol. Toxicol.*, **2**, 1011–1019
- Lee, E.T. (1980) *Statistical Methods for Survival Data Analysis*, Belmont, Lifetime Learning Publications
- Lee, P.N. (1975) *Final Analysis Experiment 1.1.1.9. The Effect of Stopping Painting (Tobacco Research Council Document M432)*, London, Tobacco Research Council
- Lee, P.N. (1979) *PSC7-Mouse Changeover Experiment A.1.5.6. Statistical Analysis of Visible Skin Tumour Data (Tobacco Advisory Council Document TA 51)*, London, Tobacco Research Council
- Lee, P.N. & O'Neill, J.A. (1971) The effect of both of time and dose applied on tumour incidence rate in benzopyrene skin painting experiments. *Br. J. Cancer*, **25**, 759–770
- Lee, P.N., Rothwell, K. & Whitehead, J.K. (1977) Fractionation of mouse skin carcinogens in cigarette smoke condensate. *Br. J. Cancer*, **35**, 730–742
- Leeper, J.D. & Woolson, R.F. (1982) Testing hypotheses for the growth curve model when the data are incomplete. *J. Stat. Comp. Simul. B*, **15**, 97–107
- Littlefield, N.A., Farmer, J.H., Gaylor, D.W. & Sheldon, W.G. (1980a) Effects of dose and time in a long-term, low-dose carcinogenic study. *J. environ. Pathol. Toxicol.*, **3**, 17–34
- Littlefield, N.A., Greenman, D.L. & Farmer, J.H. (1980b) Effect of continuous and discontinued exposure to 2-AAF on urinary bladder hyperplasia and neoplasia. *J. environ. Pathol. Toxicol.*, **3**, 35–54.
- Louis, T.A. & Orav, E.J. (1985) *Adaptive sacrifice plans for the carcinogen bioassay*. In: *Proceedings of the Symposium on Long-Term Animal Carcinogenicity Studies: A Statistical Perspective*, Washington DC, American Statistical Association, pp. 36–41
- Maltoni, C. (1975) The value of predictive experimental bioassays in occupational and environmental carcinogenesis. An example: vinyl chloride. *Ambio*, **4**, 18–23
- Mantel, N. (1963) Chi-square tests with one degree of freedom; extensions of the Mantel-Haenszel procedure. *J. Am. stat. Assoc.*, **58**, 690–700
- Mantel, N. (1966) Evaluation of survival data and two new rank order statistics arising in its consideration. *Cancer Chemother. Rep.*, **50**, 163–170
- Mantel, N. (1980) Assessing laboratory evidence for neoplastic activity. *Biometrics*, **36**, 381–399
- Mantel, N. (1983) Commentary on the work of Michalek and Mihalko relative to litter-matched data. *Stat. Med.*, **2**, 323–326
- Mantel, N. & Bryan, W.R. (1961) "Safety" testing of carcinogenic agents. *J. natl. Cancer Inst.*, **27**, 455–470

- Mantel, N. & Ciminera, J.L. (1979) Use of logrank scores in the analysis of litter-matched data on time to tumor appearance. *Cancer Res.*, **39**, 4308–4315
- Mantel, N. & Haenszel, W. (1952) Statistical aspects of the analysis of data from the retrospective studies of disease. *J. natl Cancer Inst.*, **22**, 719–748
- Mantel, N., Bohidar, W.R. & Ciminera, J.L. (1977) Mantel-Haenszel analyses of litter-matched time-to-response data, with modification for recovery of interlitter information. *Cancer Res.*, **37**, 3863–3868
- Marascuilo, L.A. & McSweeney, M. (1967) Nonparametric post hoc comparisons for trend. *Psychol. Bull.*, **67**, 401–412
- McCullagh, P. (1980) Regression models for ordinal data (with discussion). *J. R. stat. Soc. B*, **42**, 109–142
- McKnight, B. (1981) *Testing for Differences in Tumour Incidence*. PhD thesis, Madison, WI, University of Wisconsin
- McKnight, B. (1985) *Discussion of session on statistical tests for carcinogenic effects*. In: *Proceedings of the Symposium on Long-Term Animal Carcinogenicity Studies: A Statistical Perspective*, Washington DC, American Statistical Association, pp. 107–111
- McKnight, B. & Crowley, J. (1984) Tests for differences in tumor incidence based on animal carcinogenesis experiments. *J. Am. stat. Assoc.*, **79**, 639–648
- Meng, C.Y.K. (1985) *A Bayesian approach to the multiplicity problem for significance testing with binomial data*. In: *Proceedings of the Symposium on Long-Term Animal Carcinogenicity Studies: A Statistical Perspective*, Washington DC, American Statistical Association, pp. 66–72
- Meselson, M. & Russel, K. (1977) *Comparisons of carcinogenic and mutagenic potency*. In: Hiatt, H.H., Watson, J.D. & Winston, J.A., eds, *Origins of Human Cancer*, Book C, Cold Spring Harbor, NY, Cold Spring Harbour Laboratory, pp. 1473–1481
- Métivier, H., Wahrendorf, J. & Masse, R. (1984) Multiplicative effect of inhaled plutonium oxide and benzo(a)pyrene on lung carcinogenesis in rats. *Br. J. Cancer*, **50**, 215–221
- Michalek, J.E. & Mihalko, D. (1983) On the use of logrank scores in the analysis of litter-matched data on time to tumour appearance. *Stat. Med.*, **2**, 315–326
- Michalek, J.E. & Mihalko, D. (1984) Linear rank procedures on litter-matched data. *Biometrics*, **40**, 487–491
- Miescher, G., Almasy, F. & Zehender, F. (1941) Besteht ein Zusammenhang zwischen dem Benzpyreng Gehalt und der carcinogenen Wirkung des Teers? *Schweiz. med. Wochenschr.*, **34**, 1002–1007
- Miller, R.G., Jr (1981a) *Simultaneous Statistical Inference*, 2nd ed., Heidelberg, Springer-Verlag
- Miller, R.G., Jr (1981b) *Survival Analysis*, New York, NY, John Wiley & Sons
- Miller, R.G., Jr (1986) *Beyond ANOVA, Basics of Applied Statistics*, New York, John Wiley & Sons
- Mitchell, T.J. & Turnbull, B.W. (1979) Log-linear models in the analysis of disease prevalence data from survival/sacrifice experiments. *Biometrics*, **35**, 221–234

- Moolgavkar, S.H. & Knudson, A.G. (1981) Mutation and cancer: A model for human carcinogenesis. *J. natl Cancer Inst.*, **66**, 1037–1052
- Morrison, D.F. (1976) *Multivariate Statistical Methods*, 2nd ed., New York, McGraw Hill
- Munro, I.C. (1977) Considerations in chronic toxicity testing: The chemical, the dose, the design. *J. environ. Pathol. Toxicol.*, **1**, 183–197
- Nam, J. (1984) Approximate formula for sample size determinations for detecting a linear trend in proportions (unpublished manuscript)
- National Cancer Institute (1978) *Bioassay of 1,2-Dichloroethane for Possible Carcinogenicity (Technical Report Series No. 55)*, DHEW Publication No. (NIH)78–1361, Washington DC, US Department of Health, Education & Welfare
- National Toxicology Program (1982) *Carcinogenesis Bioassay of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (CAS No. 1746–01–6) in Osborne-Mendel Rats and B63F₁ Mice (Gavage Study) (National Toxicology Program Technical Report Series No. 209)*, Bethesda, MD, US Department of Health and Human Services
- Naylor, D. (1978) The computerization of histopathological data in toxicological laboratory studies using SNOP. *Meth. Inf. Med.*, **17**, 272–279
- Nelson, K., Cory, J., Hellstrom, I. & Hellstrom, K.E. (1980) T-T Hybridoma product specifically suppresses tumor immunity. *Proc. natl Acad. Sci. USA*, **77**, 2866–2870
- Nowinsky, M. (1876) Zur Frage über die Impfung der krebsigen Geschwülste. *Zentralbl. med. Wissensch.*, **14**, 790–791
- Ochi, Y. & Prentice, R.L. (1984) Likelihood inference in a correlated probit regression model. *Biometrika*, **71**, 531–543
- OECD Long-Term Expert Group (1981) *Test Guidelines for Carcinogenicity Studies*, Paris, Organization for Economic and Cooperative Development
- Page, E.B. (1963) Ordered hypotheses for multiple treatments: A significance test for linear ranks. *J. Am. stat. Assoc.*, **58**, 216–230
- Parish, S. (1981) *Exploiting Animal Tumour Data using Multistage Models*. D.Phil Thesis, Oxford, Oxford University
- Parmiani, G., Colnaghi, M.I. & Della Porta, G. (1971) Immunodepression during urethane and N-nitrosomethylurea leukaemogenesis in mice. *Br. J. Cancer*, **25**, 354–364
- Pendergast, J.F. & Broffitt, J.D. (1985) Robust estimation in growth curves. *Commun. Stat.-Simul. Comp.*, **B14**, 1919–1940
- Peraino, C., Fry, R.J.M. & Staffeldt, E. (1977) Effects of varying the onset and duration of exposure to phenobarbital on its enhancement of 2-acetylaminofluorene-induced hepatic tumorigenesis. *Cancer Res.*, **37**, 3623–3627
- Perry, L.L. & Greene, M.I. (1981) T cell subset interactions in the regulation of syngeneic tumor immunity. *Fed. Proc.*, **40**, 39–44
- Peto, R. (1974) Guidelines on the analysis of tumour rates and death rates in experimental animals. *Br. J. Cancer*, **29**, 101–105
- Peto, R. (1977) *Epidemiology, multistage models and short-term mutagenicity tests*. In: Hiatt, H.H., Watson, J.D. & Winsten, J.A., eds, *Origins of Human Cancer*, Book C, Cold Spring Harbor, NY, Cold Spring Harbor Laboratory, pp. 1403–1428
- Peto, R. & Lee, P. (1973) Weibull distributions for continuous carcinogenesis

- experiments. *Biometrics*, **29**, 457–470
- Peto, R. & Peto, J. (1972) Asymptotically efficient rank invariant test procedures (with discussion). *J. R. Stat. Soc. A*, **135**, 185–206
- Peto, R. & Pike, M.C. (1973) Conservatism of the approximation $\sum (O-E)^2/E$ in the logrank test for survival data or tumor incidence data. *Biometrics*, **29**, 579–584
- Peto, R., Lee, P.N. & Paige, W.S. (1972) Statistical analysis of the bioassay of continuous carcinogens. *Br. J. Cancer*, **26**, 258–261
- Peto, R., Roe, F.J.C., Lee, P.N., Levy, L. & Clack, J. (1975) Cancer and ageing in mice and men. *Br. J. Cancer*, **32**, 411–426
- Peto, R., Pike, M.C., Day, N.E., Gray, R.G., Lee, P.N., Parish, S., Peto, J., Richards, S. & Wahrendorf, J. (1980) *Guidelines for simple, sensitive significance tests for carcinogenic effects in long-term animal experiments*. In: *Long-term and Short-term Screening Assays for Carcinogens: A Critical Appraisal (IARC Monographs Supplement 2)*, Lyon, International Agency for Research on Cancer, pp. 311–426
- Peto, R., Gray, R., Brantom, P. & Grasso, P. (1984) *Nitrosamine carcinogenesis in 5120 rodents: chronic administration of sixteen different concentrations of NDEA, MPYR and NPIP in the water of 4440 inbred rats, with parallel studies on NDEA alone of the effect of age of starting (3, 6 or 20 weeks) and of species (rats, mice or hamsters)*. In: O'Neill, I.K., Von Borstel, R.C., Miller, T.C., Long, J. & Bartsch, H., eds, *N-Nitroso Compounds: Occurrence, Biological Effects and Relevance to Human Cancer (IARC Scientific Publications No. 57)*, Lyon, International Agency for Research on Cancer, pp. 627–665
- Pike, M.C. (1966) A method of analysis of a certain class of experiments in carcinogenesis. *Biometrics*, **22**, 142–161
- Pike, M.C. (1972) Contribution to discussion on the paper by R. Peto and J. Peto. *J. R. Stat. Soc. A*, **135**, 201–203
- Pitot, H.C. & Sirica, A.E. (1980) The stages of initiation and promotion in hepato-carcinogenesis. *Biochem. biophys. Acta*, **605**, 191–216
- Port, R., Schmähl, D. & Wahrendorf, J. (1976) Some examples of dose-response studies in chemical carcinogenesis. *Oncology*, **33**, 66–71
- Portier, C. (1981) *Optimal Bioassay Design under the Armitage-Doll Multistage Model (Technical Report)*, Department of Biostatistics, Chapel Hill, NC, University of North Carolina
- Portier, C. & Hoel, D. (1983a) Low-dose-rate extrapolation using the multistage model. *Biometrics*, **39**, 897–906
- Portier, C. & Hoel, D. (1983b) Optimal design of the chronic animal bioassay. *J. Toxicol. Environ. Health*, **12**, 1–19
- Portier, C. & Hoel, D. (1984a) Design of animal carcinogenicity studies for goodness-of-fit of multistage models. *Fundam. appl. Toxicol.*, **4**, 949–959
- Portier, C. & Hoel, D. (1984b) Type 1 error of trend tests in proportions and the design of cancer screen. *Commun. Stat.-Theor. Meth.*, **13**, 1–14
- Potthoff, R.F. & Roy, S.N. (1964) A generalized multivariate analysis of variance model useful especially for growth curve problems. *Biometrika*, **51**, 313–326

- Prentice, R.L. (1978) Linear rank tests with right censored data. *Biometrika*, **65**, 167–179
- Prentice, R.L. & Marek, P. (1979) A qualitative discrepancy between censored data rank tests. *Biometrics*, **35**, 861–867
- Prestele, H., Gaus, W. & Horbach, L. (1979) A procedure for comparing groups of time-dependent measurements. *Meth. Inf. Med.*, **18**, 84–88
- Purchase, I.F.H. (1980) Inter-species comparisons of carcinogenicity. *Br. J. Cancer*, **41**, 454–468
- Radhakrishna, S. (1965) Combination of results from several 2×2 contingency tables. *Biometrics*, **21**, 86–98
- Rai, K. & Van Ryzin, J. (1981) A generalized multihit dose-response model for low-dose extrapolation. *Biometrics*, **37**, 341–352
- Rai, K. & Van Ryzin, J. (1983) *A Dose Response Model Incorporating Michaelis-Menten Kinetics (Technical Report B-29)*, Division of Biostatistics, New York, Columbia University
- Rao, J.N.K. & Scott, A.J. (1981) The analysis of categorical data from complex sample surveys: chi-squared tests for goodness of fit and independence in two-way tables. *J. Am. stat. Assoc.*, **76**, 221–230
- Reznik, G. & Ward, J.M. (1979) Carcinogenicity of the hair-dye component 2-nitro-p-phenylenediamine: Introduction of eosinophilic hepatocellular neoplasms in female B6C3F1 mice. *Food Cosmet. Toxicol.*, **17**, 493–500
- Roe, F.J.C. & Lee, P.N. (1984) *Histopathological Data Recording, Processing, Reporting and Statistical Analysis, using Computer Program ROLEE 84* (Available from P.N. Lee, 25 Cedar Road, Sutton, Surrey, SM2 5DG, UK)
- Rosenkranz, G. (1982) APL-programs for the analysis of carcinogenicity experiments. *Comput. Programs Biomed.*, **15**, 87–92
- Rothman, K.J. & Boice, J.D., Jr (1979) *Epidemiologic Analysis with a Programmable Calculator (NIH Publication No. 79-1649)*, Washington DC, US Government Printing Office
- Salsburg, D.S. (1977) Use of statistics when examining lifetime studies in rodents to detect carcinogenicity. *J. Toxicol. environ. Health*, **3**, 611–628
- Sandland, R.L. & McGilchrist, C.A. (1979) Stochastic growth curve analysis. *Biometrics*, **35**, 255–271
- Sawyer, C., Peto, R., Bernstein, L. & Pike, M.C. (1984) Calculation of carcinogenic potency from long-term animal carcinogenesis experiments. *Biometrics*, **40**, 27–40
- Schach, S. (1982) An elementary method for the statistical analysis of growth curves. *Metrika*, **29**, 271–282
- Schwertman, N.C., Magrey, J.M. & Fridshal, D. (1981) On the analysis of incomplete growth curve data, a Monte-Carlo study of two nonparametric procedures. *Commun. Stat.-Simul. Comp.* **B10**, 51–66
- Scientific Review Panel (1983) *Saccharin: An Update*, Duke University Medical Centre
- Scribner, J.D., Scribner, N.K., McKnight, B. & Mottet, N.K. (1983) Evidence for a new model for tumour progression from carcinogenesis and tumor promotion studies with 7-bromomethylbenz[a]anthracene. *Cancer Res.*, **43**, 2034–2041

- Searle, S.R. (1971) *Linear Models*, New York, John Wiley & Sons
- Segreti, A.C. & Munson, A.E. (1981) Estimation of the median lethal dose when responses within a litter are correlated. *Biometrics*, **37**, 153–156
- Selwyn, M.R., Roth, A.J. & Weeks, B.J. (1985) *The weighted prevalence method for analyzing nonlethal tumor data*. In: *Proceedings of the symposium on Long-Term Animal Carcinogenicity Studies: A Statistical Perspective*, Washington DC, American Statistical Association, pp. 36–41
- Shimkin, M.B. (1977) *Contrary to Nature (NIH 76-720)*, Washington DC, US Department of Health, Education, and Welfare
- Shimkin, M.B. & Stoner, G.D. (1975) Lung tumors in mice: Application to carcinogenesis bioassay. *Adv. Cancer Res.*, **21**, 2–58
- Shirley, E.A.C. & Hickling, R. (1981) An evaluation of some statistical methods for analysing numbers of abnormalities found amongst litters in teratology studies. *Biometrics*, **37**, 819–829
- Shubik, P. (1985) *Saccharin/Cyclamates: Laboratory evidence*. In: Wald, N.J. & Doll, R., eds, *Interpretation of Negative Epidemiological Evidence for Carcinogenicity (IARC Scientific Publications No. 65)*, Lyon, International Agency for Research on Cancer, pp. 125–128
- Siemiatycki, J. & Thomas, D.C. (1981) Biological models and statistical interactions: an example from multistage carcinogenesis. *Int. J. Epidemiol.*, **10**, 383–387
- Sigg, E.B., Day, C. & Colombo, C. (1966) Endocrine factors in isolation-induced aggressiveness in rodents. *Endocrinology*, **78**, 679–684
- Slud, E.V., Byar, D.P. & Green, S.B. (1984) A comparison of reflected versus test-based confidence intervals for the median survival time based on censored data. *Biometrics*, **40**, 587–600
- Smith, P.G., Pike, M.C., Hill, A.P., Breslow, N.E. & Day, N.E. (1981) Algorithm AS 162. Multivariate conditional logistic analysis of stratum-matched case-control studies. *Appl. Stat.*, **30**, 190–197
- Smythe, R.T., Krewski, D. & Murdoch, D. (1986) The use of historical control information in modelling dose-response relationships in carcinogenesis. *Stat. Probab. Lett.*, **4**, 87–93
- Snedecor, G.W. & Cochran, W.G. (1980) *Statistical Methods*, 7th ed., Ames, IA, Iowa State University Press
- Society for Toxicology (1982) Animal data in hazard evaluation: Paths and pitfalls. *Fundam. appl. Toxicol.*, **2**, 101–107
- Sokal, R.R. & Rohlf, F.J. (1981) *Biometry – The Principles and Practice of Statistics in Biological Research*, 2nd ed., San Francisco, CA, W.H. Freeman & Co.
- Soms, A.P. (1977) An algorithm for the discrete Fischer's permutation test. *J. Am. stat. Assoc.*, **72**, 662–664
- Southward, G.M. & Van Ryzin, J. (1972) *Estimating the mean of a random binomial parameter*. In: Le Cam, L.M., Neyman, J. & Scott, E.L., eds, *Proceedings of the Sixth Berkeley Symposium IV*, Berkeley, CA, Univ. California Press, pp. 249–263
- Squire, R.A. (1981) Ranking animal carcinogens: A proposed regulatory approach. *Science*, **214**, 877–880

- Stinson, S.F., Hoover, K.L. & Ward, J.M. (1981) Quantitation of differences between spontaneous and induced liver tumors in mice with an automated image analyzer. *Cancer Lett.*, **14**, 143–150
- Swenberg, J.A., Barrow, C.S., Boreiko, C.J., Heck, H. d'A., Levin, R.J., Morgan, K.T. & Starr, T.B. (1983) Non-linear biological responses to formaldehyde and their implications for carcinogenic risk assessment. *Carcinogenesis*, **4**, 945–952
- Tamura, R. & Young, S.S. (1986) The incorporation of historical control information in tests of proportions: simulation study of Tarone's procedure. *Biometrics* (in press)
- Tarone, R.E. (1975) Tests for trend in life table analysis. *Biometrika*, **62**, 679–682
- Tarone, R.E. (1981) On the distribution of the maximum of the logrank statistic and the modified Wilcoxon statistic. *Biometrics*, **37**, 79–85
- Tarone, R.E. (1982) The use of historical control information in testing for a trend in proportions. *Biometrics*, **38**, 215–220
- Tarone, R.E. (1985) On heterogeneity tests based on efficient scores. *Biometrika*, **72**, 91–95
- Tarone, R.E. (1986) Correcting tests for trend in proportions for skewness. *Commun. Stat.-Theor. Math.*, **A15**, 981–998
- Tarone, R.E. & Gart, J.J. (1980) On the robustness of combined tests for trends in proportions. *J. Am. stat. Assoc.*, **75**, 110–116
- Tarone, R.E. & Ware, J. (1977) On distribution-free tests for equality of survival distributions. *Biometrika*, **64**, 156–60
- Tarone, R.E., Chu, K.C. & Ward, J.M. (1981) Variability in the rates of some common naturally occurring tumors in Fischer 344 rats and (C57BL/6M × C3H/HeN)F₁ (B6C3F₁) mice. *J. natl Cancer Inst.*, **66**, 1175–1181
- Taylor, J.M. & Friedman, L. (1974) Combined chronic feeding and three-generation reproduction study of sodium saccharin in the rat. *Toxicol. appl. Pharmacol.*, **29**, Abstract 200, p. 154
- Terracini, B., Magee, P.N. & Barnes, J.M. (1967) Hepatic pathology in rats on low dietary levels of dimethylnitrosamine. *Br. J. Cancer*, **21**, 559–565
- Theiss, J.C. (1983) The ranking of chemicals for carcinogenic potency. *Regul. Toxicol. Pharmacol.*, **3**, 1002–1007
- Thomas, D.G. (1975) Exact and asymptotic methods for the combination of 2 × 2 tables. *Comput. Biomed. Res.*, **8**, 423–446
- Thomas, D.G., Breslow, N. & Gart, J.J. (1977) Trend and homogeneity analyses of proportions and life table data. *Comput. Biomed. Res.*, **10**, 373–381
- Thomas, D.G. & Gart, J.J. (1983) Stratified trend and homogeneity analyses of proportions and life table data. *Comput. Biomed. Res.*, **16**, 116–126
- Thorpe, E. & Walker, A.I.T. (1973) The toxicology of dieldrin (HEOD). II. Comparative long-term oral toxicity studies in mice with dieldrin, DDT, phenobarbitone, beta-BHC and gamma-BHC. *Food Cosmet. Toxicol.*, **11**, 433–442
- Tietjen, G. (1974) Exact and approximate tests for unbalanced random effect designs. *Biometrics*, **30**, 573–581
- Tolley, H.D., Burdick, D., Manton, K.G. & Stallard, E. (1978) A compartment model approach to the estimation of tumour incidence and growth: investigation of a model of cancer latency. *Biometrics*, **34**, 377–389

- Tomatis, L. (1977) *The value of long-term testing for the implementation of primary prevention*. In: Hiatt, H.H., Watson, J.D. & Winsten, J.A., eds. *Origins of Human Cancer*, Book C, Cold Spring Harbor, NY, Cold Spring Harbor Laboratory, pp. 1339–1357
- Tomatis, L. (1979) The predictive value of rodent carcinogenicity tests in the evaluation of human risks. *Ann. Rev. Pharmacol. Toxicol.*, **19**, 511–530
- Tomatis, L., Turusov, V., Day, N. & Charles, R.T. (1972) The effect of long-term exposure to DDT on CF-1 mice. *Int. J. Cancer*, **10**, 489–506
- Tomatis, L., Partensky, C. & Montesano, R. (1973) The predictive value of mouse liver tumour induction in carcinogenicity testing – A literature survey. *Int. J. Cancer*, **12**, 1–20
- Tomatis, L., Turusov, V., Charles, R.T., Boiocchi, M. & Gati, E. (1974) Liver tumors in CF-1 mice exposed for limited periods to technical DDT. *Z. Krebsforsch.*, **82**, 25–35
- Turnbull, B.W. & Mitchell, T.J. (1978) Exploratory analysis of disease prevalence data from survival/sacrifice experiments. *Biometrics*, **34**, 555–570
- Turnbull, B.W. & Mitchell, T.J. (1984) Nonparametric estimation of the distribution of time to onset for specific diseases in survival/sacrifice experiments. *Biometrics*, **40**, 41–50
- Twort, C.C. & Twort, J.M. (1930) The relative potency of carcinogenic tars and oils. *J. Hyg.*, **29**, 373–379
- Twort, C.C. & Twort, J.M. (1933) Suggested methods for the standardisation of the carcinogenic activity of different agents for the skin of mice. *Am. J. Cancer*, **17**, 293–320
- Ullrich, R.L. (1980) *Carcinogenesis in mice after low dose and dose rates*. In: Meyn, R.E. & Withers, H.R. eds, *Radiation Biology in Cancer Research*, New York, Raven Press, pp. 309–319
- Ullrich, R.L. & Storer, J.B. (1979a) Influence of gamma irradiation on the development of neoplastic disease in mice. I. Reticular tissue tumors. *Radiat. Res.*, **80**, 303–316
- Ullrich, R.L. & Storer, J.B. (1979b) Influence of gamma irradiation on the development of neoplastic disease in mice. II. Solid tumors. *Radiat. res.*, **80**, 317–324
- Ullrich, R.L., Jernigan, M.C., Cosgrove, G.E., Satterfield, L.C., Bowles, N.D. & Storer, J.B. (1976) The influence of dose and dose rate on the incidence of neoplastic disease in RFM mice after neutron irradiation. *Radiat. Res.*, **68**, 115–131
- Upton, G.J.G. (1982) A comparison of alternative tests for the 2 × 2 comparative trial. *J.R. stat. Soc. A*, **145**, 86–105
- Van Ryzin, J. (1980) Quantitative risk assessment. *J. occup. Med.*, **22**, 321–326
- Vos, J.G. & de Roij, T. (1972) Immunosuppressive activity of a polychlorinated biphenyl preparation on the humoral immune response in guinea pigs. *Toxicol. appl. Pharmacol.*, **21**, 549–555
- Wagner, J.C., Berry, G. & Timbrell, V. (1973) Mesotheliomata in rats after inoculation with asbestos and other materials. *Br. J. Cancer*, **28**, 173–185

- Wahrendorf, J. (1983) Simultaneous analysis of different tumor types in a long-term carcinogenicity study with scheduled sacrifices. *J. natl Cancer Inst.*, **70**, 915-921
- Wahrendorf, J. (1984) Discussion of D.R. Cox's paper on "Interaction". *Int. stat. Rev.*, **52**, 29-30
- Wahrendorf, J. & Brown, C.C. (1980) Bootstrapping a basic inequality in the analysis of joint action of two drugs. *Biometrics*, **36**, 653-657
- Wahrendorf, J., Zentgraf, R. & Brown, C.C. (1981) Optimal designs for the analysis of interactive effects of two carcinogens or other toxicants. *Biometrics*, **37**, 45-54
- Wahrendorf, J., Mahon, G.A.T. & Schumacher, M. (1985) A nonparametric approach to the statistical analysis of mutagenicity data. *Mutat. Res.*, **147**, 5-13
- Walker, A.I.T., Thorpe, E. & Stevenson, D.E. (1973). The toxicology of dieldrin (HEOD). I. Long-term oral toxicity studies in mice. *Food Cosmet. Toxicol.*, **11**, 415-432
- Walters, D.E. (1979) In defence of the arc sine approximation. *Statistician*, **28**, 219-222
- Ward, J. (1984) *Pathology of toxic, preneoplastic and neoplastic lesions in rodents*. In: Douglas, J.F., ed., *Carcinogenesis - Mutagenesis*, Clifton, NJ, Humana Press, pp. 97-130
- Ward, J.M. & Reznick, G. (1983) Refinements of rodent pathology and the pathologist's contribution to evaluation of carcinogenesis bioassays. *Progr. exp. Tumour Res.*, **26**, 266-291
- Ward, J.M. & Vlahakis, G. (1978) Evaluation of hepatocellular neoplasms in mice. *J. natl Cancer Inst.*, **61**, 807-811
- Ward, J.M. & Weisburger, E.K. (1975) Intestinal tumors in mice treated with a single injection of *N*-nitroso-*N*-butylurea. *Cancer Res.*, **35**, 1938-1943
- Ward, J.M., Goodman, D.G., Griesemer, R.A., Hardisty, J.F., Schueler, R.L., Squire, R.A. & Strandberg, J.D. (1978) Quality assurance for pathology in rodents carcinogenesis tests. *J. environ. Pathol. Toxicol.*, **2**, 371-378
- Ward, J.M., Goodman, D.G., Squire, R.A., Chu, K.C. & Linhart, M.S. (1979) Neoplastic and nonneoplastic lesions in aging (C57BL/6N × C3H/HeN)F1 (B6C3F₁) mice. *J. natl Cancer Inst.*, **63**, 849-854
- Weinberger, M.A. (1973) The blind technique (Letter to the Editor). *Science*, **181**, 219-220
- Weinberger, M.A. (1979) How valuable is blind evaluation in histopathologic examination in conjunction with animal studies? *Toxicol. Pathol.*, **7**, 14-17
- Weindruch, R. & Walford, R.L. (1982) Dietary restriction in mice beginning at 1 year of age: effect on life-span and spontaneous cancer incidence. *Science*, **215**, 1415-1418
- Weinstein, I.B. (1981) The scientific basis for carcinogen detection and primary cancer prevention. *Cancer*, **47**, 1133-1141
- Weisburger, J.H. & Williams, G.M. (1981) Carcinogen testing: Current problems and new approaches. *Science*, **214**, 401-407
- Whittemore, A.S. (1978) Quantitative theories of oncogenesis. *Adv. Cancer Res.*, **27**, 55-88

- Whittemore, A.S. & Keller, J.B. (1978) Quantitative theories of carcinogenesis. *SIAM Rev.*, **20**, 1–30
- Williams, D.A. (1975) The analysis of binary responses from toxicological experiments involving reproduction and teratogenicity. *Biometrics*, **31**, 949–952
- Williams, G.M., Katayama, S. & Ohmori, T. (1981) Enhancement of hepatocarcinogenesis by sequential administration of chemicals: summation versus promotion effects. *Carcinogenesis*, **2**, 1111–1117
- Wishart, J. (1938) Growth-rate determinations in nutrition studies with the bacon pig and their analysis. *Biometrika*, **30**, 16–28
- Wogan, G.N., Pagliolunga, S. & Newberne, P.M. (1974) Carcinogenic effects of low dietary levels of aflatoxin B₁ in rats. *Food Cosmet. Toxicol.*, **12**, 681–685
- Woolson, R.F. & Leeper, J.D. (1980) Growth curve analysis of complete and incomplete longitudinal data. *Commun. Stat.-Theor. Meth.*, **A9**, 1491–1513
- World Health Organization (1984) *Guidelines for Drinking Water Quality*, Vol. I, *Recommendations*, Geneva
- Yamagiwa, K. & Ichikawa, K. (1915) Experimentelle Studie über die Pathogenese der Epithelialgeschwülste. *Mitt. Med. Fak. Kais. Univ. Tokyo*, **15**, 295–344